

## CLAIMS

What is claimed is:

- 5      1. A method for simulating a mixed-signal system comprising acts of:
  - generating a matrix-based wavelet operator representation of equations characterizing a system, with the matrix-based wavelet operator representation including wavelet connection coefficients;
  - selecting a number of wavelets and a set of wavelet basis functions with which to represent a performance of the system, whereby the wavelet operator, the number of wavelets and the set of wavelet basis functions represent a wavelet model of the system; and
  - iteratively applying the wavelet model over a series of clock cycles to develop a behavioral model of the system.
- 10     2. A method for simulating a mixed-signal system as set forth in Claim 1, where the system is an electrical circuit.
- 15     3. A method for simulating a mixed-signal system as set forth in Claim 2, where the electrical circuit is a delta-sigma modulator.
- 20     4. A method for simulating a mixed-signal system as set forth in Claim 3, wherein in the generating act, the matrix-based wavelet operator is developed by a wavelet-Galerkin method.
- 25     5. A method for simulating a mixed-signal system as set forth in Claim 4, wherein in the generating act, the matrix-based wavelet operator is developed directly from a system diagram or from equations that describe the system.

6. A method for simulating a mixed-signal system as set forth in Claim 5, wherein in the selecting act the number of wavelets is selected independently for each iteration of the acts of the method.
- 5        7. A method for simulating a mixed-signal system as set forth in Claim 6, wherein in the selecting act, the set of wavelet basis functions is selected independently for each iteration of the acts of the method.
8. A method for simulating a mixed-signal system as set forth in Claim 7, further comprising acts of receiving a specification for a system model and outputting the behavioral model of the system.
- 10        9. A method for simulating a mixed-signal system as set forth in Claim 1, wherein in the generating act, the matrix-based wavelet operator is developed by a wavelet-Galerkin method.
- 15        10. A method for simulating a mixed-signal system as set forth in Claim 1, wherein in the generating act, the matrix-based wavelet operator is developed directly from a system diagram.
- 20        11. A method for simulating a mixed-signal system as set forth in Claim 1, wherein in the generating act, the matrix-based wavelet operator is developed directly from equations that describe the system.
- 25        12. A method for simulating a mixed-signal system as set forth in Claim 1, wherein in the selecting act the number of wavelets is selected independently for each iteration of the acts of the method.

13. A method for simulating a mixed-signal system as set forth in Claim 1, wherein in the selecting act, the set of wavelet basis functions is selected independently for each iteration of the acts of the method.
- 5        14. A method for simulating a mixed-signal system as set forth in Claim 1, further comprising acts of receiving a specification for a system model and outputting the behavioral model of the system.
- 10      15. An apparatus for simulating a mixed-signal system comprising a data processing system, the data processing system having a processor and a memory coupled with the processor, the data processing further including means for:
  - generating a matrix-based wavelet operator representation of equations characterizing a system, with the matrix-based wavelet operator representation including wavelet connection coefficients;
  - 15        selecting a number of wavelets and a set of wavelet basis functions with which to represent a performance of the system, whereby the wavelet operator, the number of wavelets and the set of wavelet basis functions represent a wavelet model of the system; and
  - 20        iteratively applying the wavelet model over a series of clock cycles to develop a behavioral model of the system.
16. An apparatus for simulating a mixed-signal system as set forth in Claim 15, where the system is an electrical circuit.
- 25      17. An apparatus for simulating a mixed-signal system as set forth in Claim 16, where the electrical circuit is a delta-sigma modulator.
- 30      18. An apparatus for simulating a mixed-signal system as set forth in Claim 17, wherein the means for generating develops the matrix-based wavelet operator by a wavelet-Galerkin method.

19. An apparatus for simulating a mixed-signal system as set forth in Claim 18,  
wherein the means for generating develops the matrix-based wavelet operator  
directly from a system diagram or from equations that describe the system.  
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20. An apparatus for simulating a mixed-signal system as set forth in Claim 19,  
wherein the means for selecting independently selects the number of wavelets for  
each iteration.
- 10 21. An apparatus for simulating a mixed-signal system as set forth in Claim 20,  
wherein the means for selecting independently selects the set of wavelet basis  
functions for each iteration.
- 15 22. An apparatus for simulating a mixed-signal system as set forth in Claim 21,  
further comprising means for receiving a specification for a system model and  
outputting the behavioral model of the system.
- 20 23. An apparatus for simulating a mixed-signal system as set forth in Claim 1,  
wherein the means for generating develops the matrix-based wavelet operator by  
a wavelet-Galerkin method.
- 25 24. An apparatus for simulating a mixed-signal system as set forth in Claim 1,  
wherein the means for generating develops the matrix-based wavelet operator  
directly from a system diagram.
25. An apparatus for simulating a mixed-signal system as set forth in Claim 1,  
wherein the means for generating develops the matrix-based wavelet operator  
directly from equations that describe the system.

26. An apparatus for simulating a mixed-signal system as set forth in Claim 1,  
wherein the means for selecting independently selects the number of wavelets for  
each iteration.

5        27. An apparatus for simulating a mixed-signal system as set forth in Claim 1,  
wherein the means for selecting independently selects the set of wavelet basis  
functions for each iteration.

10      28. An apparatus for simulating a mixed-signal system as set forth in Claim 1, further  
comprising means for receiving a specification for a system model and outputting  
the behavioral model of the system.

29. A computer program product for simulating a mixed-signal system comprising a  
computer readable medium having means, encoded thereon for:  
15           generating a matrix-based wavelet operator representation of equations  
· characterizing a system, with the matrix-based wavelet operator representation  
including wavelet connection coefficients;  
              selecting a number of wavelets and a set of wavelet basis functions with  
which to represent a performance of the system, whereby the wavelet operator,  
20           the number of wavelets and the set of wavelet basis functions represent a wavelet  
model of the system; and  
              iteratively applying the wavelet model over a series of clock cycles to  
develop a behavioral model of the system.

25      30. A computer program product for simulating a mixed-signal system as set forth in  
Claim 29, where the system is an electrical circuit.

30      31. A computer program product for simulating a mixed-signal system as set forth in  
Claim 30, where the electrical circuit is a delta-sigma modulator.

32. A computer program product for simulating a mixed-signal system as set forth in  
Claim 31, wherein the means for generating develops the matrix-based wavelet  
operator by a wavelet-Galerkin method.

5       33. A computer program product for simulating a mixed-signal system as set forth in  
Claim 32, wherein the means for generating develops the matrix-based wavelet  
operator directly from a system diagram or from equations that describe the  
system.

10      34. A computer program product for simulating a mixed-signal system as set forth in  
Claim 33, wherein the means for selecting independently selects the number of  
wavelets for each iteration.

15      35. A computer program product for simulating a mixed-signal system as set forth in  
Claim 34, wherein the means for selecting independently selects the set of  
wavelet basis functions for each iteration.

20      36. A computer program product for simulating a mixed-signal system as set forth in  
Claim 35, further comprising means for receiving a specification for a system  
model and outputting the behavioral model of the system.

25      37. A computer program product for simulating a mixed-signal system as set forth in  
Claim 29, wherein the means for generating develops the matrix-based wavelet  
operator by a wavelet-Galerkin method.

38. A computer program product for simulating a mixed-signal system as set forth in  
Claim 29, wherein the means for generating develops the matrix-based wavelet  
operator directly from a system diagram.

39. A computer program product for simulating a mixed-signal system as set forth in  
Claim 29, wherein the means for generating develops the matrix-based wavelet  
operator directly from equations that describe the system.

5       40. A computer program product for simulating a mixed-signal system as set forth in  
Claim 29, wherein the means for selecting independently selects the number of  
wavelets for each iteration.

10      41. A computer program product for simulating a mixed-signal system as set forth in  
Claim 29, wherein the means for selecting independently selects the set of  
wavelet basis functions for each iteration.

15      42. A computer program product for simulating a mixed-signal system as set forth in  
Claim 29, further comprising means for receiving a specification for a system  
model and outputting the behavioral model of the system.